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10/687,699	10/20/2003	Young-hoon Jeong	Q77117	2834

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EXAMINER	
LEE, TOMMY D	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/687,699	JEONG, YOUNG-HOON	
	Examiner	Art Unit	
	Thomas D. Lee	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,12-18 and 22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,12-18 and 22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office action is responsive to Applicant's RESPONSE UNDER 37 C.F.R. § 1.111, filed June 30, 2008. Claims 1-8, 12-18 and 22 are pending.

Response to Arguments

2. Applicant's arguments filed in response to the rejections of the above claims as set forth in the prior Office action mailed March 31, 2008 have been fully considered but they are not persuasive.

In response to the prior rejections, Applicant asserts that the supplementary reference (U.S. Patent 5,768,411 to Shu et al., hereinafter Shu) fails to disclose or fairly suggest "a mask generator that receives a respective stored mask threshold value corresponding to the address from the mask memory and generates respective mask threshold values for each of a plurality of color channels based on said received respective stored mask threshold value." According to Applicant, Shu, while teaching using different color matrices for dithering different color components, and the relationship between these different matrices, "fails to disclose or even fairly suggest, a mask generator that generates respective mask threshold values for each of a plurality of color channels based on a received respective stored mask threshold value, wherein the mask generator is within an apparatus for halftoning which also comprises an address generator that receives a pixel in an image intended for halftoning. Rather, Shu merely discloses a preferred relationship for generating the matrices (D_C, D_M, D_Y) - independent of a [sic] apparatus for halftoning an image. As illustrated in the apparatus

for dithering in Shu (FIG. 7), the matrices are already generated." (see current amendment, pages 2-4).

However, this argument fails to recognize the fact that generation of matrices within an apparatus for halftoning, including an address generator that receives a pixel in an image intended for halftoning, is already disclosed in the primary reference (U.S. Patent 5,822,451 to Spaulding et al., hereinafter Spaulding, see column 4, lines 7-22). Shu was cited to show that it would be desirable to determine threshold values for magenta and yellow color channels based on a respective stored threshold value for cyan, so that dots of different colors do not coincide with each other in light-colored regions, thereby providing a smoother appearance (Shu: column 4, line 60 - column 5, line 2; column 5, lines 33-47). One of ordinary skill in the art would have thus been motivated to modify the teaching of Spaulding, by simply providing a means for calculating threshold values for magenta and yellow color channels based on the threshold value for cyan generated in Spaulding's apparatus, in place of the separate dither matrices for each color.

Applicant further states that “because Shu merely discloses using different matrices to dither each different color component as well as a relationship between these matrices so that different colors tend to print in different locations: (1) Shu fails to compensate for the deficiencies of Spaulding; and (2) Shu fails to recognize or address the problem of excess memory requirements resulting from the different matrices used. It is in this way that Shu actually adds to the memory requirements of the printing apparatus.” (see current amendment, page 5). However, as mentioned above, Shu

does compensate for deficiencies of Spaulding, in that Shu's teaching ensures that dots of different colors do not coincide with each other in light-colored regions, thereby providing a smoother appearance. Furthermore, Shu, in combination with Spaulding in the manner previously mentioned, clearly reduces memory requirements in that Shu's calculation of threshold values for magenta and yellow color channels eliminates the need to provide storage of threshold values in separate dither matrices for each color.

Applicant further states that claims 2-8 and 13-18 are allowable by virtue of their dependency from claim 1 (see current amendment, pages 5-6). However, claim 1 is not allowable, and thus the rejections of all of the claims are maintained.

Claim Rejections - 35 USC § 103

3. Claims 1-3, 6-8, 12, 13, 16-18 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spaulding in view of Shu.

Regarding claims 1-3, Spaulding discloses an apparatus for halftoning a color image comprising: an address generator that receives a pixel in an image intended for halftoning and generates an address corresponding to a position of the pixel in a mask memory storing mask threshold values for one color channel (column 4, lines 7-16); a mask generator that receives a respective stored mask threshold value corresponding to the address from the mask memory and generates respective mask threshold values for each of a plurality of color channels (column 4, lines 16-22); and a comparison unit that sequentially receives the respective mask threshold value generated for each of the plurality of color channels and a pixel value in the image intended for halftoning, compares both values with each other, and outputs a bilevel value according to a

predetermined rule (column 4, lines 22-30). The address generator comprises: a pixel position information storage unit that receives the pixel in the image intended for halftoning and stores the position of the pixel (multi-channel input color images 40A, 40B, 40C generate image column and row addresses x and y); a mask memory that stores mask threshold values for each color channel generated according to a predetermined algorithm (optimized dither matrices 44A, 44B, 44C); and a mask address generator that sequentially receives information on the pixel position from the pixel position information storage unit and generates the address corresponding to the position in the mask memory, the pixel position information storage unit comprising an X-direction counter that counts X-coordinates of pixels, and a Y-direction counter that counts Y-coordinates of pixels (modulo operators 42A, 42B, 42C convert column and row addresses from multi-channel input images to dither matrix column and row addresses x_d and y_d).

Spaulding does not disclose generation of respective mask threshold values for each of a plurality of color channels “based on said received respective stored mask threshold value,” as recited in claim 1. However, Shu discloses a mask generator comprising: a mask information input unit that receives mask information for one color channel generated by a predetermined algorithm (reference dither matrix (cyan) shown in Fig. 3A); an offset calculator that calculates a predetermined offset (fractions of pixel component value range determined (column 5, lines 33-47)); and a mask calculator that calculates masks for a plurality of channels using information on the predetermined offset calculated by the offset calculator (magenta and yellow matrices generated by

adding fractions of pixel component range to corresponding values of cyan matrix (column 5, lines 33-47)). Clearly, respective mask threshold values for each of a plurality of color channels (magenta and yellow) are generated, based on a received respective stored mask (cyan matrix) threshold value. This enables production of separate threshold values for each color without the need to provide storage of the threshold values in separate dither matrices for each color, thereby reducing memory requirements for the apparatus. Furthermore, applying the dithering method of Shu to the teaching of Spaulding assures that dots of the different colors do not coincide with each other in light-colored regions, thereby providing a smoother appearance (Shu: column 4, line 60 – column 5, line 2; column 5, lines 33-47). Therefore, it would have been obvious for one of ordinary skill in the art to modify the teaching of Spaulding by providing the offset and mask calculators as disclosed in Shu.

Regarding claims 6-8, Shu discloses a mask information input unit that receives the respective stored mask threshold value for the mask memory (reference dither matrix (cyan) shown in Fig. 3A); an offset calculator that calculates a predetermined offset (fractions of pixel component value range determined (column 5, lines 33-47)); and a mask calculator that calculates the respective mask threshold value for each of the plurality of channels using information of the predetermined offset calculated by the offset calculator and the respective stored mask threshold value (magenta and yellow matrices generated by adding fractions of pixel component range to corresponding values of cyan matrix (column 5, lines 33-47)). The offset calculator calculates the predetermined offset by dividing a largest pixel value in the image intended for

halftoning by a number of colors used in the halftoning apparatus (magenta and yellow matrices generated by adding one-third and two thirds of the pixel component value range to corresponding elements of the cyan matrix (column 5, lines 41-47)). In order to generate the respective mask threshold value for each of the plurality of channels, the mask calculator receives the respective stored mask threshold value from the mask information input unit, adds the predetermined offset calculated by the offset calculator to the respective stored mask threshold value, and if a resulting value is greater than a largest pixel value, calculates the respective mask threshold value by subtracting the largest pixel value from the resulting value (noting Fig. 6, when the yellow threshold or the magenta threshold reaches a value corresponding to the pixel component value range, the threshold returns to zero).

Regarding claims 12 and 13, Spaulding discloses a method for halftoning a color image comprising the steps of: (a) receiving a pixel in an image intended for halftoning and generating as address corresponding to a position of the pixel in a mask memory storing mask threshold values for one color channel (column 4, lines 7-16); (b) receiving a respective stored mask threshold value corresponding to the address from the mask memory and generating respective mask threshold values for each of a plurality of color channels (column 4, lines 16-22); and (c) sequentially receiving the respective mask threshold value generated for each of the plurality of color channels and a pixel value in the image intended for halftoning, comparing both values with each other, and outputting a bilevel value according to a predetermined rule (column 4, lines 22-30). The step (a) comprises the steps of: (a1) storing in advance the respective stored mask

threshold value for one color channel generated according to a predetermined algorithm (optimized dither matrices 44A, 44B, 44C); (a2) receiving the pixel in the image intended for halftoning and storing the position of the pixel (multi-channel input color images 40A, 40B, 40C generate image column and row addresses x and y); and (a3) sequentially receiving information on the pixel position stored in the step (a2) and generating the address of the respective stored mask threshold value in the mask memory corresponding to the position (modulo operators 42A, 42B, 42C convert column and row addresses from multi-channel input images to dither matrix column and row addresses x_d and y_d).

Spaulding does not disclose generation of respective mask threshold values for each of a plurality of color channels "based on said received respective stored mask threshold value," as recited in claim 12. However, as mentioned above regarding claim 1, Shu discloses a mask generator comprising: a mask information input unit that receives mask information for one color channel generated by a predetermined algorithm (reference dither matrix (cyan) shown in Fig. 3A); an offset calculator that calculates a predetermined offset (fractions of pixel component value range determined (column 5, lines 33-47)); and a mask calculator that calculates masks for a plurality of channels using information on the predetermined offset calculated by the offset calculator (magenta and yellow matrices generated by adding fractions of pixel component range to corresponding values of cyan matrix (column 5, lines 33-47)). Clearly, respective mask threshold values for each of a plurality of color channels (magenta and yellow) are generated, based on a received respective stored mask (cyan

matrix) threshold value. This enables production of separate threshold values for each color without the need to provide storage of the threshold values in separate dither matrices for each color, thereby reducing memory requirements for the apparatus. Furthermore, applying the dithering method of Shu to the teaching of Spaulding assures that dots of the different colors do not coincide with each other in light-colored regions, thereby providing a smoother appearance (Shu: column 4, line 60 – column 5, line 2; column 5, lines 33-47). Therefore, it would have been obvious for one of ordinary skill in the art to modify the teaching of Spaulding by providing the offset and mask calculators as disclosed in Shu.

Regarding claims 16-18, Shu discloses the steps of: (b1) receiving the respective stored mask threshold value from the mask memory (reference dither matrix (cyan) shown in Fig. 3A); (b2) calculating a predetermined offset (fractions of pixel component value range determined (column 5, lines 33-47)); and calculating the respective mask threshold value for each of the plurality of channels using information of the predetermined offset calculated in the step (b2) and the respective stored mask threshold value (magenta and yellow matrices generated by adding fractions of pixel component range to corresponding values of cyan matrix (column 5, lines 33-47)). The predetermined offset is calculated by dividing a largest pixel value in the image intended for halftoning by a number of colors used for the halftoning method (magenta and yellow matrices generated by adding one-third and two thirds of the pixel component value range to corresponding elements of the cyan matrix (column 5, lines 41-47)). The respective mask threshold value is generated for each of the plurality of channels by

receiving the respective stored mask threshold value stored in the mask memory, adding the predetermined offset to the respective stored mask threshold value, and if a resulting value is greater than a largest pixel value, calculates the respective mask threshold value by subtracting the largest pixel value from the resulting value (noting Fig. 6, when the yellow threshold or the magenta threshold reaches a value corresponding to the pixel component value range, the threshold returns to zero).

Claim 22 recites the limitations of above-rejected claim 12, recorded on a computer-readable recording medium. While a computer-readable recording medium is not expressly disclosed in Spaulding in view of Shu, it is well known in the art to provide either an internal ROM or an external storage device, such as a CD-ROM, for providing instructions to a CPU, and such means are necessary for enabling the CPU to perform image processing. It would have been obvious for one of ordinary skill in the art to provide a storage device for storing program instructions in Spaulding in view of Shu, thereby enabling the CPU to perform the halftoning operation.

4. Claims 4, 5, 14 and 15 rejected under 35 U.S.C. 103(a) as being unpatentable over Spaulding in view of Shu as applied to claims 2 and 12 above, and further in view of U.S. Patent 6,154,195 (Young et al., hereinafter Young).

Regarding claims 4, 5, 14 and 15, Spaulding in view of Shu does not expressly disclose the use of an8x8 Bayer Dither Table. Young discloses a method for performing dithering, using an arrangement similar to that of Spaulding (Fig. 5), and employing a Bayer dither matrix for halftoning image data (column 7, lines 53-67). It would have been obvious for one of ordinary skill in the art to modify the teaching of Spaulding in

view of Shu by using a Bayer dither matrix, as disclosed in Young, so as to reduce banding artifacts to get smoother transitions between color gradients (column 71 lines 53-57). Young shows a 4x4 matrix (Fig. 4), but one of ordinary skill in the art would have recognized the size of the dither matrix used for halftoning image as a matter of design choice.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas D. Lee whose telephone number is (571) 272-7436. The examiner can normally be reached on Monday-Friday, 7:30-5:00, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward L. Coles can be reached on (571) 272-7402. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Thomas D Lee/
Primary Examiner, Art Unit 2625